List of Claims

1.-12. (canceled)

13. (currently amended) An apparatus for controlling a valve member relative to a valve contact surface, wherein the member is operatively connected to an a piezoelectric actuator, comprising:

an actuator control circuit in electrical communication with the actuator, wherein the actuator control circuit includes a connector and applies a control signal to the actuator, the control signal controlling movement of the member relative to the contact surface, and receives an output from the actuator; ~~and~~

a seat detection circuit in electrical communication with the connector of the actuator control circuit, wherein the seat detection circuit determines contact of the member with the contact surface from the output via receipt of an actuator voltage on the connector; and

wherein the actuator is a piezoelectric device.

14. (original) The apparatus, as set forth in claim 13, wherein the output comprises a voltage produced by the actuator.

15. (previously presented) The apparatus, as set forth in claim 13, wherein the seat detection circuit determines a rate of change of the output.

16. (previously presented) The apparatus, as set forth in claim 13, wherein the seat detection circuit determines contact of the member with the contact surface from a comparison of the rate of change of the output to a predetermined value.

17. (currently amended) An apparatus for controlling velocity of a valve member relative to a valve contact surface, wherein the member is operatively connected to an actuator, comprising:

an actuator control circuit in electrical communication with the actuator, wherein the actuator control circuit includes a connector and applies a control signal to the actuator, the

control signal controlling movement of the member relative to the contact surface, and receives an output from the actuator;

a seat detection circuit in electrical communication with the connector of the actuator control circuit, wherein the seat detection circuit determines contact of the member with the contact surface from the output via receipt of an actuator voltage on the connector; ~~and~~

a velocity control circuit in electrical communication with the actuator control circuit and seat detection circuit, wherein the velocity control circuit provides an input to the actuator control circuit for controlling velocity of the member; and

wherein the actuator is a piezoelectric device.

18. (previously presented) The apparatus, as set forth in claim 17, further comprising:

a position control circuit in electrical communication with the actuator control circuit, the seat detection circuit, and the velocity control circuit, the position control circuit having a stored charge value and a current charge value.

19. (original) The apparatus, as set forth in claim 18, wherein the position control circuit determines a charge error as a function of the stored charge value and the current charge value.

20. (original) The apparatus, as set forth in claim 19, wherein the velocity control circuit determines the input as a function of the charge error.

21. (previously presented) The apparatus, as set forth in claim 18, wherein the position control circuit includes an integrator that integrates current flowing through the actuator during a currently actuation cycle to determine the current charge value.

22. (original) The apparatus, as set forth in claim 21, wherein the stored charge value is determined by the seat detection circuit during a prior actuation circuit.

23-26. (canceled)

27. (previously presented) The apparatus, as set forth in claim 14, wherein the seat detection circuit detects the impact of the member with the contact surface by detecting an abrupt change in the amplitude of the output voltage.

28. (currently amended) The apparatus, as set forth in claim 13, wherein the output is used to adjust the control signal to slow the member as it approaches and impacts the contact surface in a subsequent actuation cycle.

29. (previously presented) The apparatus, as set forth in clam 13, wherein the control signal and the output are supplied through a single pair of electrical leads.

30. (previously presented) The apparatus, as set forth in claim 17, wherein the output comprises a voltage produced by the actuator.

31. (previously presented) The apparatus, as set forth in claim 30, wherein the seat detection circuit detects the impact of the member with the contact surface by detecting an abrupt change in the amplitude of the output voltage.

32. (currently amended) The apparatus, as set forth in claim 17, wherein the input is derived from the output and is utilized by the actuator control circuit to slow the member as it approaches and impact the contact surface in a subsequent actuation cycle.

33. (previously presented) The apparatus, as set forth in claim 17, wherein the position control circuit includes a comparator that compares a desired charge determined from the output of a prior actuation cycle with the current charge on the actuator to determine a difference and provide the difference to the velocity control circuit.

34. (previously presented) The apparatus, as set forth in claim 33, wherein the difference is used by the velocity control circuit to determine the input.

35. (currently amended) The apparatus, as set forth in claim 34, wherein the input is utilized by the actuator control circuit to slow the member as it approaches and impacts the contact surface in a subsequent actuation cycle.